

Efficiency of Producing High-Quality Seed Rice Under Production Conditions

Normatov Abduvali Ubaydulla ugli
Rice Research Institute

Qodirov Bakhtiyor Gulmuhammadovich
Grain and Legume Crops Research Institute, Director of the Forage Crops Scientific-Experimental Station

Beknaev Ulugbek Alisher ugli
Deputy Director of the Bakhmal Scientific and Experimental Station of the Research Institute of Rainfed Agriculture

Abstract. *This article presents the efficiency of producing seed rice of the medium-maturing Iskandar variety under production conditions, when nitrogen fertilizer was applied purely at a rate of N150 P120 K120 kg/ha, and of the late-maturing Lazurniy variety at N180 kg/ha, with three applications during germination, tillering, and panicle initiation stages. In the Iskandar variety, compared to the control (st), yield was higher by 20.8 c/ha, the amount of conditioned seed output increased by 1559.5 kg/ha, and income reached 17,152 thousand soums. For one hectare of seed rice cultivation, total expenses amounted to 5,482 thousand soums, while income was 17,818 thousand soums, resulting in an additional net profit of 12,336 thousand soums and a profitability level 32.4% higher. In the Lazurniy variety, compared to the control (st), yield was higher by 17.8 c/ha, the amount of conditioned seed output increased by 1480.3 kg/ha, and income rose by 20,723 thousand soums. Total expenses amounted to 6,552 thousand soums/ha, while income reached 21,512 thousand soums. As a result, compared to the control, an additional net profit of 14,961 thousand soums per hectare was obtained, and the profitability level was 30.1% higher.*

Keywords: *Iskandar, Lazurniy, Conditioned Seed, Quality Indicators, Variety, NPK, Rate, Profitability Level, Income, Additional Profit, Thousand Soums.*

Introduction

As a result of the ongoing reforms in the agricultural sector of our Republic, extensive measures are being implemented to increase grain production, particularly rice cultivation and processing. In particular, in accordance with Resolution No. PQ-4973 of the President of the Republic of Uzbekistan, dated February 2, 2021, “On measures for the further development of rice cultivation,” the *Comprehensive Program for the Development of Rice Farming in Uzbekistan for 2021–2022* (Annex 4) defines, under clause 8.1, key tasks such as seed multiplication and the development of resource-efficient cultivation technologies [1].

Considering the growing global demand for rice products, the area under rice cultivation worldwide continues to expand. Scientific advances and best agricultural practices demonstrate that modern, well-organized seed production systems can increase seed quality, varietal purity, and crop yield by 25–30%. At the same time, crop productivity largely depends on the level of applied technologies, as

well as on the proper selection of varieties and the quality of seeds used for planting. The additional yield obtained through these approaches provides significant economic benefits [2].

Enhancing the efficiency of agricultural production requires the effective implementation of advanced scientific achievements and modern agrotechnologies. In this context, the specialization, consolidation, and scientifically grounded organization of primary seed production represent key factors. Research findings indicate that the use of high-quality seed materials significantly contributes to increasing crop productivity (Copeland & McDonald, 2001; IRRI, 2021) [2].

Today, in agro-clusters, farms, and household plots engaged in seed rice production, there are incorrect approaches in the application of mineral fertilizers, especially nitrogen. As a result, both the quantity and quality indicators of seed rice are decreasing. To find solutions to these pressing problems, scientific research was conducted by A.U. Normatov and B.G. Qodirov during 2022–2024 under the topic “The effect of nitrogen fertilization on the quality indicators of seed rice” [3].

It has been proven that in order to produce high-quality seed rice from the Iskandar and Lazurniy varieties, the application of nitrogen fertilizers during the plant’s growth period at rates of N150, P120, K120 kg/ha for Iskandar, and N180, P150, K150 kg/ha for Lazurniy, with three applications (at germination, tillering, and panicle initiation stages), results in higher and better-quality seed yields.

For agro-clusters and farms in our republic specializing in seed rice production, a guideline titled “Effective use of nitrogen fertilizers in seed rice cultivation” has been developed. Based on this guideline, the cultivation of seed rice contributes to improving its quality indicators, and through the sale of high-quality seed material, it enhances the economic efficiency of rice farming [4], [5].

Materials and Methods

Study area and climatic conditions. Field experiments were conducted during 2023–2024 in multiple agro-ecological zones of Uzbekistan, including “Yangi Yo‘l Guruch Ta‘minot” LLC in Syrdarya district, Syrdarya region; experimental fields of the Rice Research Institute in O‘rta Chirchiq district, Tashkent region; as well as “Xorazm Faxri” and “Bog‘olon Nurli Diyor” farms located in Yangibozor district, Khorezm region (Urgench district, Uzbekistan) [6], [7].

The experiments were systematically designed and implemented in accordance with the guidelines outlined in the *Manual for State Variety Testing of Agricultural Crops* (1994). Field observations were carried out following standard methodologies described in *Methods of Field Experiments* [8]. Sampling of plant and soil materials, as well as the analysis of their chemical composition, were performed based on established analytical procedures and methods [9].

Research objects. The study focused on the rice varieties “Iskandar” and the late-maturing variety “Lazurniy,” along with different types of nitrogen mineral fertilizers.

Result and Discussion

The results of research on the effect of nitrogen fertilizers on the seed quality indicators of the Iskandar and Lazurniy rice varieties were implemented and tested under production conditions in 2023–2024. Trials were conducted on 139.0 ha at “Yangiyo‘l Guruch Ta‘minot” LLC in Sirdaryo district, Sirdaryo region; on 50.0 ha at the experimental fields of the Rice Research Institute in Orta Chirchiq district, Tashkent region; on 41.0 ha at “Khorezm Fakhri” farm in Yangibozor district, Khorezm region; on 31.0 ha at “Bogolon Nurli Diyor” farm; and on 10.0 ha at “Baraka-Baltimor” farm, totaling 271 hectares [10].

In the control (st) Variant 2, where the Iskandar rice variety was fertilized with nitrogen at a pure rate of NPK120 kg/ha, applied twice during the tillering and panicle initiation stages, the yield was 52.6 c/ha. The amount of conditioned seed obtained was 3210.1 kg/ha, with a selling price of 11 thousand soums, generating an income of 35,311 thousand soums. Technical rice amounted to 584.1 kg/ha, with a selling price of 1.1 thousand soums, producing an income of 642.6 thousand soums. By-products containing more than 20% grain totaled 468.4 kg/ha, with a selling price of 0.6 thousand soums, generating 281.0 thousand soums. Hulled (dehusked) rice amounted to 10.5 kg, with a selling price of

2 thousand soums, producing 21.1 thousand soums. Overall, expenses per hectare were 24,761 thousand soums, while income reached 36,256 thousand soums. Net profit amounted to 11,495 thousand soums, and the profitability level was 46.4%.

In Variant 7, where the Iskandar rice variety was fertilized purely with nitrogen at a rate of N150, P120, K120 kg/ha, applied three times during germination, tillering, and panicle initiation stages, the highest indicators compared to other variants were achieved. In this variant, the yield was 73.4 c/ha. The amount of conditioned seed obtained was 4769.4 kg/ha, with a selling price of 11 thousand soums, generating an income of 52,463 thousand soums. Technical rice amounted to 961.2 kg/ha, with a selling price of 1.1 thousand soums, producing an income of 1,057.3 thousand soums. By-products containing more than 20% grain totaled 873.2 kg/ha, with a selling price of 0.6 thousand soums, generating 523.9 thousand soums. Hulled (dehusked) rice amounted to 14.7 kg, with a selling price of 2 thousand soums, producing 29.4 thousand soums. Overall, expenses per hectare were 30,243 thousand soums, while income reached 54,074 thousand soums. Net profit amounted to 23,831 thousand soums, and the profitability level was 78.8% [11].

Table 1. Implementation of research results into practice. (2023-2024 yy).

(thousand soums)

№	Average yield, c/ha	Conditioned seed			Technical rice			By-product containing more than 20% grain			Hulled (dehusked) rice			Total expenses, soums/ha	Income, soums/ha	Net profit, soums/ha	Profitability level, %
		amount, kg	selling price	Income	amount, kg	selling price	Income	amount, kg	selling price	Income	amount, kg	selling price	Income				
Iskandar variety																	
1	47,7	283,0,4	11	311,35	486,0	1,1	534,6	419,3	0,6	251,6	14,3	2	28,6	231,89	319,49	876,0	37,8
2	52,6	321,0,1	11	353,11	584,1	1,1	642,6	468,4	0,6	281,0	10,5	2	21,1	247,61	362,56	1149,5	46,4
3	58,1	361,8,1	11	397,99	696,9	1,1	766,6	563,3	0,6	338,0	11,6	2	23,2	266,17	409,27	143,10	53,8
4	59,8	368,6,6	11	405,52	675,2	1,1	742,7	561,7	0,6	337,0	12,0	2	23,9	272,64	416,56	143,92	52,8
5	56,6	345,5,2	11	380,07	616,4	1,1	678,0	514,6	0,6	308,8	17,0	2	33,9	251,46	390,28	138,82	55,2
6	66,9	417,1,4	11	458,86	735,4	1,1	808,9	541,5	0,6	324,9	13,4	2	26,7	277,39	470,46	193,07	69,6
7	73,4	476,9,4	11	524,63	961,2	1,1	1057,3	873,2	0,6	523,9	14,7	2	29,4	302,43	540,74	238,31	78,8
8	69,1	431,1,1	11	474,23	877,6	1,1	965,3	753,2	0,6	451,9	7,6	2	15,2	292,55	488,55	196,00	67,0
9	60,8	367,0,8	11	403,79	692,8	1,1	762,1	589,5	0,6	353,7	12,2	2	24,3	258,38	415,19	156,81	60,7
10	61,9	377,4,4	11	415,18	717,8	1,1	789,5	606,4	0,6	363,8	12,4	2	24,8	265,49	426,96	161,47	60,8

1	69,	445	11	490	830	1,1	913	690	0,6	414	14,	2	27,	292	504	2116	72,4
1	8	8,6		45	,3		,4	,8		,5	0		9	39	01	1	
1	70,	436	11	479	763	1,1	839	742	0,6	445	14,	2	28,	293	492	199	67,8
2	0	1,0		71	,0		,3	,0		,2	0		0	79	84	05	

Compared to Variant 2 (st), the average yield in this treatment was 20.8 c/ha higher, while the amount of conditioned seed increased by 1,559.5 kg/ha. The income rose by 17,152 thousand soums. Technical rice output was 377.1 kg/ha higher, resulting in an additional income of 414.6 thousand soums. The by-product containing more than 20% grain increased by 404.8 kg, with income higher by 242.9 thousand soums. Hulled (dehusked) rice increased by 4.2 kg/ha, with income higher by 50.5 thousand soums. Total expenses amounted to 5,482 thousand soums, while income reached 17,818 thousand soums. Net profit increased by 12,336 thousand soums (see Table 1). The profitability level was 32.4% higher [12], [13].

According to the production trials of the Lazurniy rice variety, in Variant 2 (st), where nitrogen fertilizer was applied purely at N150 kg/ha, twice during the tillering and panicle initiation stages, the average yield was 53.0 c/ha. The amount of conditioned seed obtained was 3289.9 kg/ha, with a selling price of 14 thousand soums, generating an income of 46,059 thousand soums. Technical rice amounted to 684.5 kg/ha, with a selling price of 2 thousand soums, producing an income of 1,369.0 thousand soums. By-products containing more than 20% grain totaled 579.6 kg/ha, with a selling price of 1 thousand soums, generating 579.6 thousand soums. Hulled (dehusked) rice amounted to 11.0 kg/ha, with a selling price of 3 thousand soums, producing 33.1 thousand soums. Overall, expenses per hectare were 29,912 thousand soums, while income reached 48,041 thousand soums. Net profit amounted to 18,128 thousand soums, and the profitability level was 60.6%.

In Variant 7, where the Lazurniy rice variety was fertilized purely with nitrogen at a rate of N180 kg/ha, applied three times during germination, tillering, and panicle initiation stages, the highest indicators were achieved compared to other variants. In this variant, the yield was 70.8 c/ha. The amount of conditioned seed obtained was 4770.2 kg/ha, with a selling price of 14 thousand soums, generating an income of 66,782 thousand soums. Technical rice amounted to 962.9 kg/ha, with a selling price of 2 thousand soums, producing an income of 1,925.7 thousand soums. By-products containing more than 20% grain totaled 801.2 kg/ha, with a selling price of 1 thousand soums, generating 801.2 thousand soums. Hulled (dehusked) rice amounted to 14.7 kg/ha, with a selling price of 3 thousand soums, producing 44.1 thousand soums. Overall, expenses per hectare were 36,464 thousand soums, while income reached 69,553 thousand soums (see Table 2). Net profit amounted to 33,089 thousand soums, and the profitability level was 90.7%.

Table 2. Implementation of research results into practice. (2023-2024 yy).

(thousand soums)

№	Ave rage yield, c/ha	Conditioned seed			Technical rice			By-product containing more than 20% grain			Hulled (dehusked) rice			Total expenses, soums/ha	Income, soums/ha	Net profit, soums/ha	Profitability level, %
		amount, kg	selling price	Income	amount, kg	selling price	Income	amount, kg	selling price	Income	amount, kg	selling price	Income				
Lazurniy variety																	
1	50,0	306	14	428	600	2	120	490	1	490	10,5	3	31,6	285	445	160	56,2
		1,9		66	,8		1,6	,1		,1			6	41	89	48	

2	53,	328	14	460	684	2	136	579	1	579	11,0	3	33,	299	480	181	60,6
s	0	9,9		59	,5		9,0	,6		,6			1	12	41	28	
t																	
3	57,	383	14	536	769	2	153	653	1	653	12,	3	36,	326	558	231	70,9
	8	1,0		34	,9		9,7	,8		,8	2		7	89	64	75	
4	63,	400	14	560	837	2	167	712	1	712	13,	3	39,	338	584	245	72,6
	1	2,5		35	,1		4,2	,9		,9	1		2	69	61	92	
5	52,	328	14	460	665	2	133	577	1	577	7,7	3	23,	294	479	184	62,7
	9	6,8		15	,5		1,0	,5		,5			1	75	47	72	
6	67,	420	14	588	892	2	178	759	1	759	13,	3	41,	336	614	278	82,8
	1	2,9		41	,2		4,3	,7		,7	9		8	04	27	23	
7	70,	477	14	667	962	2	192	801	1	801	14,	3	44,	364	695	330	90,7
	8	0,2		82	,9		5,7	,2		,2	7		1	64	53	89	
8	67,	425	14	595	889	2	177	743	1	743	13,	3	41,	348	6211	272	78,1
	3	3,4		48	,6		9,2	,7		,7	9		7	84	2	28	
9	60,	381	14	533	780	2	156	612	1	612	12,	3	38,	315	555	239	76,0
	9	2,0		67	,5		0,9	,8		,8	9		7	80	80	99	
1	65,	408	14	571	870	2	174	744	1	744	13,	3	41,	331	597	265	80,2
0	9	5,5		97	,0		0,0	,7		,7	9		8	42	24	82	
1	68,	424	14	594	957	2	191	765	1	765	14,	3	42,	344	621	277	80,5
1	0	6,9		57	,2		4,3	,7		,7	2		5	43	79	36	
1	65,	417	14	584	845	2	169	675	1	675	13,	3	40,	345	608	263	76,1
2	0	3,8		34	,7		1,4	,2		,2	6		9	41	41	00	

Under production conditions, compared to the control (Variant 2), in Variant 7, where nitrogen fertilizer was applied purely at a rate of N180 kg/ha, three times during germination, tillering, and panicle initiation stages, the yield was 17.8 c/ha higher. The amount of conditioned seed increased by 1,480.3 kg/ha. Income rose by 20,723 thousand soums. Technical rice output was 278.4 kg/ha higher, resulting in an additional income of 556.7 thousand soums. The by-product containing more than 20% grain increased by 221.6 kg/ha, with income higher by 221.6 thousand soums. Hulled (dehusked) rice increased by 3.7 kg/ha, with income higher by 11 thousand soums. Total expenses amounted to 6,552 thousand soums, while income reached 21,512 thousand soums. Compared to the control variant, an additional 14,961 thousand soums of net profit was obtained per hectare. The profitability level was 30.1% higher [14], [15].

Conclusions

Under production conditions, for the mid-season Iskandar variety, when fertilized purely with nitrogen at a rate of N150 P120 K120 kg/ha, applied three times during germination, tillering, and panicle initiation stages, and for the late-season Lazurniy variety, when fertilized purely with nitrogen at a rate of N180 kg/ha with the same timing, the following results were obtained:

- For Iskandar, compared to the control (Variant 2), yield increased by 20.8 c/ha, and conditioned seed output was higher by 1,559.5 kg/ha.
- Income rose by 17,152 thousand soums.
- Total expenses per hectare amounted to 5,482 thousand soums, while income reached 17,818 thousand soums.
- Additional net profit was 12,336 thousand soums, and the profitability level was 32.4% higher.

For the Lazurniy rice variety, compared to the control (Variant 2), when fertilized purely with nitrogen at a rate of N180 kg/ha, applied three times during germination, tillering, and panicle

initiation stages:

- Yield increased by 17.8 c/ha.
- Conditioned seed output was higher by 1,480.3 kg/ha.
- Income rose by 20,723 thousand soums.
- Total expenses per hectare amounted to 6,552 thousand soums, while income reached 21,512 thousand soums.
- Additional net profit was 14,961 thousand soums per hectare compared to the control.
- Profitability level was 30.1% higher.

References:

- [1] B. I. Qalandarov, *The effect of seed rate and mineral fertilizers on the growth, development, and productivity of rice varieties*, PhD diss., Tashkent, 2020, pp. 115–116.
- [2] Ch. T. Kashkabaeva, *The effect of cultivation techniques on the productivity of mid-season rice varieties under meadow-swamp soil conditions (in Tashkent region)*, PhD diss., Tashkent, 2018, pp. 115–116.
- [3] B. Q. Ravshanov, *Efficiency of nitrogen fertilizer rates and bacterial preparations in increasing rice productivity*, PhD diss., Tashkent, 2024, p. 117.
- [4] B. A. Dospekhov, *Methodology of field experiments*. Moscow: Kolos, 1985, pp. 350–423.
- [5] V. N. Polozhiy, *Methodology of economic evaluation of experimental variants in rice cultivation*. Krasnodar: All-Union RRI, 1976, 93 p.
- [6] M. A. Sattarov et al., *Recommendations for obtaining high yields of rice in Uzbekistan*. Tashkent, 2019, 24 p.
- [7] Decree of the President of the Republic of Uzbekistan No. PQ-4973, “On measures for the further development of rice cultivation,” Feb. 2, 2021.
- [8] Sh. Nurmatov, Q. Mirzajanov, et al., *Methods of Conducting Field Experiments*. Tashkent, 2007, pp. 8–51.
- [9] N. V. Artamonova, *Methods of Agrochemical Analysis of Soils and Plants in Central Asia*, 5th ed. Tashkent, 1977, pp. 14–27.
- [10] G. V. Udoenko, *Salt Resistance of Cultivated Plants*. Leningrad: Kolos, 1977, p. 128.
- [11] International Rice Research Institute (IRRI), *Rice Production Manual*, 2017.
- [12] L. O. Copeland and M. B. McDonald, *Principles of Seed Science and Technology*, 2001.
- [13] International Rice Research Institute (IRRI), *Quality Seed Production Guidelines for Rice*, 2021.
- [14] S. Yoshida, *Fundamentals of Rice Crop Science*, 1981.
- [15] N. K. Fageria, “Yield physiology of rice,” *Journal of Plant Nutrition*, 2007.